Claims

1. A catheter comprising:

a handle;

a shaft portion coupled to a distal end of the handle;

a tip portion;

a braided conductive member coupled to the shaft portion and the tip portion; and

a mandrel fixedly attached to the tip portion and slidably disposed within the shaft portion;

wherein actuation of the mandrel expands the braided conductive member from an undeployed to a deployed position.

2. The catheter of claim 1, wherein the mandrel comprises at least two tiers having different diameters.

3. The catheter of claim 2, wherein the mandrel comprises three tiers having different diameters.

4. The catheter of claim 1, wherein the braided conductive member comprises an electrode having insulated and uninsulated portions.

5. The catheter of claim 4, wherein the braided conductive member further comprises a plurality of electrically independent portions.

6. The catheter of claim 5, wherein uninsulated portions of electrically independent portions of the braided conductive member do not contact each other in the deployed or undeployed position.

7. The catheter of claim 1, wherein the mandrel comprises a lumen having a distal opening.

8. The catheter of claim 7, wherein the distal opening is coupled to an opening of the tip portion.

9. The catheter of claim 7, wherein the lumen further comprises a proximal opening, and wherein a fluid source is coupled to the proximal opening to allow fluid to flow from the fluid source to the lumen.

10. The catheter of claim 7, wherein the lumen further comprises a proximal opening, and wherein a device port is coupled to the proximal opening to allow fluid to flow from the fluid source to the lumen.

11. The catheter of claim 10, wherein the device port is coupled to the handle.

12. The catheter of claim 7, wherein the mandrel is slidably disposed within the handle, and wherein the mandrel is coupled to an actuator to control movement of the mandrel.

13. The catheter of claim 1, wherein the mandrel is slidably disposed within the handle, and wherein the mandrel is coupled to an actuator to control movement of the mandrel.

14. The catheter of claim 1, wherein actuation of the mandrel such that the mandrel is moved proximally along a longitudinal axis of the shaft expands the braided conductive member from an undeployed to a deployed position.

15. The catheter of claim 1, wherein movement of the tip portion toward the shaft compresses the braided conductive member laterally.

16. The catheter of claim 1, wherein the mandrel is formed of a superelastic material.

17. The catheter of claim 16, wherein the mandrel is formed of nitinol.

18. The catheter of claim 1, wherein the mandrel is coated with a high dielectric coating.

19. The catheter of claim 18, wherein the mandrel is coated with parylene.

20. The catheter of claim 1, wherein at least a portion of the tip portion is constructed of an elastomeric material.

21. The catheter of claim 20, wherein the elastomeric material includes silicone.

22. The catheter of claim 20, wherein the elastomeric material includes polyurethane.

23. The catheter of claim 1, wherein the tip portion comprises a cap portion and an anchor portion secured to the cap portion, and wherein the mandrel is secured to the anchor portion and a distal end of the braided conductive member is secured between the cap portion and the anchor portion.

24. The catheter of claim 23, wherein the anchor portion includes a projection that engages with an edge of the cap portion.

25. The catheter of claim 23, wherein a bonding agent is included between the cap portion and the anchor portion.

26. The catheter of claim 23, wherein at least a distal portion of the cap portion comprises an elastomeric material.

27. The catheter of claim 1, further comprising a plug disposed about the mandrel at the distal end of the shaft and adapted to form a substantially fluid-tight seal between the mandrel and the shaft.

28. A method of deploying a braided conductive member of a catheter, wherein the braided conductive member is coupled to a tip portion and a shaft of the catheter, the method comprising:

moving the tip portion towards the shaft such that the braided conductive member is compressed longitudinally and expanded radially.

29. The method of claim 28, wherein the braided conductive member comprises an electrode having insulated and uninsulated portions.

30. The method of claim 29, wherein the braided conductive member further comprises a plurality of electrically independent portions, and wherein moving the tip portion towards the shaft comprises preventing uninsulated portions of electrically independent portions of the braided conductive member from contacting each other.

31. The method of claim 28, wherein moving the tip portion towards the shaft includes shortening the distance between the proximal end of the shaft and the distal end of the tip portion.

32. The method of claim 28, wherein a mandrel is coupled between the tip portion and the shaft, and wherein moving the tip portion towards the shaft includes retracting at least a portion of the mandrel within the shaft.

33. The method of claim 32, wherein a mandrel is coupled between the tip portion and the shaft, and wherein moving the tip portion towards the shaft includes retracting at least a portion of the mandrel within the shaft.

34. The method of claim 32, wherein moving the tip portion towards the shaft includes retracting at least a portion of the mandrel coaxially within the shaft.

35. The method of claim 32, wherein the mandrel includes a lumen, and wherein the method further comprises:

releasing fluid from an opening in the lumen.

36. The method of claim 35, wherein act of releasing fluid includes releasing fluid from an opening at the distal end of the tip portion of the catheter.

37. The method of claim 32, wherein the mandrel includes a lumen, and wherein the method further comprises:

introducing a device into the lumen; and

extending at least a portion of the device through an opening in the lumen.

38. A catheter comprising:

a handle;

a shaft portion coupled to a distal end of the handle;

a tip portion, at least a portion of the tip portion being constructed of an elastomeric material;

a braided conductive member coupled to the shaft portion and the tip portion.

39. The catheter of claim 38, wherein the elastomeric material includes silicone.

40. The catheter of claim 38, wherein the elastomeric material includes polyurethane.

41. The catheter of claim 38, wherein the tip portion is constructed of a first portion constructed of an elastomeric material and comprising a first mating feature, and a second portion comprising a second mating feature that is constructed to mate with the first mating feature, and wherein the braided conductive member is fixedly attached to the second portion.

42. The catheter of claim 41, wherein the first mating feature comprises a recess and the second mating feature comprises a protrusion.

43. The catheter of claim 41, further comprising a mandrel fixedly attached to the second portion of the tip portion and slidably disposed within the shaft portion;

wherein actuation of the mandrel expands the braided conductive member from an undeployed to a deployed position.

44. A catheter comprising:

a handle;

a shaft portion coupled to a distal end of the handle;

a conductive member coupled to the shaft portion, the conductive member formed of a plurality of filaments; and

a thermocouple wire coupled to a filament of the conductive member via a conductive junction, wherein the thermocouple wire is formed of a different material than the filament, and wherein the conductive junction is located between first and second ends of the filament.

45. The catheter of claim 44, wherein the conductive junction is formed of a conductive epoxy.

46. The catheter of claim 44, wherein the conductive junction is formed on an outer portion of the conductive member.

47. The catheter of claim 44, wherein the conductive member is a braided conductive member.

48. The catheter of claim 44, wherein the filament is coupled to a connector that is adapted to be connected to an ablation energy source.

49. A method of using a catheter having a conductive member comprising a plurality of filaments, the method comprising:

measuring a signal between a thermocouple wire and a filament of the conductive member; and

applying ablation energy via the filament.

50. The method of claim 49, wherein measuring a signal between a thermocouple wire and a filament and applying ablation energy via the filament occur simultaneously.

51. The method of claim 49, further comprising determining a temperature based on the signal

52. A method of using a catheter having a conductive member comprising a plurality of filaments, the method comprising:

measuring a signal between a thermocouple wire and a filament of the conductive member and determining a temperature based on the signal; and

measuring an electrical heart signal via the filament.

53. The method of claim 52, wherein measuring a signal between a thermocouple wire and a filament and measuring an electrical heart signal via the filament occur simultaneously.

54. A steering mechanism for a catheter, comprising:

a steering cable having a first diameter; and

an anchor disposed at a distal end of the steering cable, the anchor having a second diameter;

wherein the first diameter is less than a diameter of a lumen through which at least a portion of the steering cable passes and the second diameter is greater than the diameter of the lumen.

55. The steering mechanism of claim 54, wherein the anchor is integrally formed with the steering cable.

56. The steering mechanism of claim 54, wherein the anchor is fixedly attached to the distal end of the steering cable.

57. The steering mechanism of claim 54, wherein the lumen has a counterbore at a distal end thereof and the anchor is disposed in the counterbore.

58. The steering mechanism of claim 57, further comprising means for fixedly securing the anchor in the counterbore.

59. A method of controlling the rotational friction of a thumbwheel of a catheter handle, comprising:

increasing the rotational friction on the thumbwheel by compressing a spring that contacts the thumbwheel; and

decreasing the rotational friction on the thumbwheel by decompressing the spring.

60. The method of claim 59, wherein increasing the rotational friction on the thumbwheel includes increasing the rotational friction such that the thumbwheel independently maintains its position.

61. The method of claim 59, wherein increasing the rotational friction on the thumbwheel includes forcing the thumbwheel into tighter engagement with the spring.

62. A handle for use with a catheter, the handle comprising:

a housing;

a thumbwheel coupled to the housing;

a spring disposed within the housing in contact with the thumbwheel; and

means for increasing compression of the spring to increase rotational friction on the thumbwheel.

63. The method of claim 62, wherein the spring is disposed within a central bore of the thumbwheel.

64. The method of claim 62, wherein the means for increasing the compression of the spring includes means for increasing the rotational friction on the thumbwheel such that the thumbwheel maintains a level of tension on a pull cable coupled to the thumbwheel.

65. The method of claim 62, wherein the means for increasing the compression of the spring comprises a plurality of complimentary mating features disposed on a surface of the thumbwheel and on a surface of the housing that force the thumbwheel into tighter engagement with the compression spring when the thumbwheel is moved from a first position to a second position.